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Prroximate, vitamin, aminoacid and mineral composition of milky mushroom, Calocybe Indica (P&C). Var. Apk2 commonly cultivated in tamilnadu

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ABSTRACT

Mushrooms are well known for their nutritional and gastronomic values. In the present study the nutritional value was analysed by proximate, aminoacid, vitamin and mineral composition of the edible mushroom, Calocybe indica var. APK2 commercially grown in Tamilnadu, India were investigated. The results of the analyses showed that milky mushroom is a good source of protein $(27.25\pm0.33\%)$, carbohydrates $(49.06\pm0.16\%)$ and fibre $(14.07\pm0.34\%)$. These macrofungi are equally rich in vitamins namely Vitamin A $(0.62\pm0.69 \text{ mg/g})$, Vitamin B $(1.95\pm0.82 \text{ mg/g})$, Vitamin E $(0.81\pm0.96 \text{ mg/g})$ and Vitamin C $(0.41\pm0.71 \text{ mg/g})$. One gram of mushroom was found to possess mineral elements like Ca $(20.94\pm0.13\text{ mg})$; P $(469.30\pm0.62\text{ mg})$; Fe $(59.16\pm0.24\text{ mg})$; Zn $(10.36\pm0.37\text{ mg})$; Mn $(1.00\pm0.21\text{ mg})$; Mg $(11.20\pm0.11\text{ mg})$; K $(59.34\pm0.36\text{ mg})$, Na $(13.15\pm0.15\text{ mg})$ and Se $(0.001\pm0.22\text{ mg})$. In addition these mushroom fulfill the criteria of all the dietary supplements and can be suggested as a good source of functional food with significant amount of nutrients.

Keywords: Milky mushroom, nutrition, dietary supplement.

INTRODUCTION

Mushroom is a general term used mainly for the fruiting body of macrofungi (Ascomycota and Basidiomycota) and represents only a short reproductive stage in their life cycle [1]. They may be epigeous or hypogeous, large enough to be seen with the naked eyes and can be picked by hand [2]. Mushrooms have a long association with humankind and provide profound biological and economical impact. In the recent times they valued as delicious and nutritional foods in many countries, are increasingly studied for their chemical and nutritional characteristics [3]. In India the total recorded mushrooms are approximately 850 species [4]. There are references to the use of mushrooms as food and medicine in India in the ancient medical treatise, Charaka Samhita (3000±500 BC). They have rich nutritional value with high content of proteins, vitamins, minerals, fibers, trace elements and low calories [5,6].

Calocybe indica is an important edible mushroom which can be cultivated throughout the year in the entire parts of India even in hot humid climate [7]. Genus *Calocybe* consists of about 20 species of mushroom. Fruit body of this mushroom is umbrella like, fleshy, milky white, more sturdy and has longer shelf life under normal conditions and has a variety of nutritional and non-nutritional components possibly involved in their medicinal effects and accumulation of these compounds depends on stage of maturity at the time of harvest [8,9,10,11]. The present study

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is intended to investigate the nutritional composition namely proximate, aminoacid, vitamin and mineral composition of these mushrooms.

MATERIALS AND METHODS

Sampling of mushroom species

Cultivated fruiting bodies of *Calocybe indica* var.APK2 were obtained from the Sujii Mushroom farm, Perundurai, Erode, Tamilnadu, India. The studied samples were authenticated by Dr.A.S.Krishnamoorthy, Professor, Department of Plant Pathology, Tamilnadu Agricultural University, Coimbatore. A voucher specimen has been deposited at the mushroom unit, Tamilnadu Agricultural University, Coimbatore.

All the samples were lyophilized, reduced to a fine dried powder (20 mesh), mixed to obtain homogenous samples and stored in a desiccator, protected from light, until further analysis.

Proximate Analysis

The samples were analyzed for the chemical composition (moisture, proteins, fat, fibre, carbohydrates and ash) using the standard procedures [12]. The protein content estimated by Lowry's method; the crude fat was determined by extracting a known weight of powdered sample with petroleum ether, using a Soxhlet apparatus; the ash content was determined by incineration at $600\pm15^{\circ}$ C. Total carbohydrates were calculated by difference. Energy was calculated according to the following equation: Energy (gcal) = 4 x (%protein + %carbohydrate) + 9 x % fat).

Vitamin Analysis

Vitamins were determined using spectrophotometric method, according to AOAC [12]. The powdered sample was extracted by EDTA/TCA extraction method and the extracts were read off at different wave lengths.

Mineral Analysis

Minerals were determined using wet digestion extraction methods. Samples were digested using 5ml nitric acid and 2ml perchloric acid, and made upto 50ml with distilled water. They were measured by Atomic adsorption Spectrophotometer [12].

Aminoacid Analysis

Amino acid analyses were performed by ion exchange chromatography utilizing the Technicon Amino Acid Analyzer, according to the procedure outlined by Hamilton and Slyke [13].

Statistical Analysis

All experiments were conducted in triplicates and the parameters were given as means \pm standard error. Both mean and standard deviation performed were appropriate, using the statistical package within Microsoft® Excel Version 2007.Ink, and the graphs were plotted using software Origin 6.0.

RESULTS AND DISCUSSION

The proximate composition and energy value for investigated mushroom, *Calocybe indica* is shown in Table:1. Moisture content of the mushroom was found to be $89.88\pm0.49\%$, which was similar to the earlier reports of Kamugisha and Sunanda Sharan [9], who stated that the moisture content of the fresh mushroom are generally 85-92% and they also opined that the moisture content of the mushroom varies with harvesting time, maturation period and environmental conditions. And also Manzi [3] stated that the moisture content of the mushrooms decides the nutritional quality of the mushroom. Crude fat content of the mushroom was observed to be $3.13\pm0.48\%$, which is similar to the earlier reports of Pushpa and Purosothama [14]. Maheshwari [11] notify that though the fat content of the mushrooms are very low, they contain some essential fatty acids. However, mushrooms does not fulfill the fatty acid requirements of human body, they are mainly consumed for low calorie diet [15].

Major compounds of mushroom are protein and carbohydrate. Protein and carbohydrate content of the tested mushroom were found to be 27.25±0.33% and 49.06±0.16% respectively. Total protein and carbohydrate content varying between 21-50% and 41 -65% were reported in many mushrooms. Similar quantity of protein and carbohydrate were reported from the earlier works of Nuhu Alam [16]; Pushpa and Purusthoma [14]; Prabu and Kumuthakalvalli, [17]. Since mushroom form the important source of vegetative proteins, the determination of

quality of such protein becomes essential. It is well documented that standard of a proteinacious food depends on its essential aminoacid composition. The essential aminoacid composition of the tested mushroom were presented in Figure:1, results obtained were in agreement with the earlier reports of Manzi [3]; Kurztman [18], who stated that many edible mushroom protein contain most of the essential aminoacids. Among all the aminoacids obtained sulphur containing aminoacid, methionine was found to be very low, this was in accordance with the reports of Bano [19], who stated that even low amount of sulphur containing aminoacids are important in considering the quality of mushroom protein. Thus, the protein content of the *Calocybe indica* is said to be highly significant.

Carbohydrates are mainly present in the mushroom as polysaccharides and glycoproteins. The most abundant polysaccharide are chitin, α and β glucans. Mushroom glucans are also components of soluble and insoluble dietary fibre [20]. Dietary fibre of the mushroom ranges between 10-31 g/100 g dry weight[21]. Tested *Calocybe* mushroom was found to contain 14.07±0.34% crude fibre, which have been reported in earlier studies [14,17]. The ash content of the mushroom was observed to be 11.45±0.52%. Mattila [22] reported that the main constituents of the mushroom ash were K and P, this can be endorsed to the high K and P content of the mushroom. Ash content of the mushroom was in accordance with the earlier data [23,24]. Calculated from the above analyzed proximate parameters the calorific value of the *Calocybe indica* was found to be 333.41 k.cal g⁻¹.

Results on vitamin and mineral analysis of *Calocybe indica* were represented in figure 2 and 3 respectively. The vitamin content of many mushrooms have been investigated and results of such investigations show that they are rich in vitamins A,B-complex, C, D and E [8]. In the present study among the four vitamins quantified namely Vitamin A, B, C and E, *Calocybe* was found to be a rich source of vitamin B followed by Vitamin E, A and C. Results obtained in the analyses corroborate with the earlier reports of Sathish [10] and Barros [25]. Since vitamins are essential in the diet of man and conventional sources of vitamins are scarce [26], *Calocybe indica* can be a good alternative for the vitamin diet. Mineral elements are also essential for human health, since they have important physiological effects on different organs and cellular mechanisms [21]. The present study revealed that *Calocybe indica* like other mushrooms have a mix of minerals reported were well in conformity with the earlier studies [9,10]. However, it was reported that the individual chemical composition of the mushroom largely varies with species and also depends on the age of the fruiting body, composition of the compost and substrate. Nutritional composition is also affected by environmental factors like oxygen, temperature and light source. It was also reported that the nutritional property changes by flush to flush [15].

Parameters	Composition (%)
Moisture	89.88±0.49
Ash	11.45±0.52
Protein	27.25±0.33
Carbohydrate	49.06±0.16
Fiber	14.07±0.34
Fat	3.13±0.48
Energy(gCal)	333.41

Table:1 Proximate Composition of Calocybe indica

Figure:1 Essential Aminoacid Composition of Calocybe indica







Figure:3 Mineral Composition of Calocybe indica

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CONCLUSION

It can be concluded that the investigated edible mushroom, *Calocybe indica* are good source of food in terms of protein, carbohydrate, fibre, aminoacids, energy values and with a good array of vitamins and minerals. Due to their nutritional values, these mushrooms may provide significant support against malnutrition diseases. In case of the current nutrient deficiency and health problems all over the world, regular consumption of *Calocybe indica* mushroom can play an important role in health and disease prevention.

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